

TERMINAL 117 ENGINEERING EVALUATION/COST ANALYSIS

Executive Summary

Terminal 117 (T-117) is one of seven sites within the Lower Duwamish Waterway (LDW) Superfund site that have been identified by the US Environmental Protection Agency (EPA) and the Washington State Department of Ecology as candidate sites for early cleanup because sediments at these sites are associated with greater ecological and/or human health risk. At T-117, the early action area (EAA) is located in the aquatic portion (i.e. sediment) of the site as defined in the LDW early action candidate site memorandum (Windward 2003b). In the time since the T-117 EAA was identified, the Port of Seattle (Port) and the City of Seattle (City) have conducted a series of environmental investigations there to further characterize environmental conditions in the nearshore area and shoreline bank, identify a removal boundary, and to identify potential sources of contamination.

This report is an engineering evaluation/cost analysis (EE/CA) for such a removal action at T-117. It presents background information on the site, discusses available data and the proposed boundary of the removal action, documents the development and evaluation of alternatives for conducting the non-time-critical removal action (NTCRA) and discusses the rationale for the recommended removal action that will be implemented by the Port and the City, subject to EPA approval.

SITE CHARACTERIZATION AND RISK ASSESSMENT

The T-117 EAA owned by the Port is located on the west side of the LDW from approximately RM 3.5 to RM 3.7, as measured from the southern tip of Harbor Island (Figure 2-1). The site is bordered by the South Park Marina to the north and the Boeing South Park Facility to the south.

Polychlorinated biphenyls (PCBs) were identified as the primary risk driver for the removal action at the T-117 EAA (Windward 2003b; Windward et al. 2003b). This finding was based on historical activities and data. After reviewing historical data in the vicinity of T-117, field sampling investigations were

conducted to characterize the nature and extent of PCBs in the T-117 EAA in order to determine the removal boundary, establish the general engineering characteristics of the shoreline sediment and bank soils, and identify potential sources of recontamination. The field investigations were iterative events; each additional field effort was based on the results of the preceding effort, ultimately providing the data to further support the removal boundary. The sequence of data collection events undertaken to complete this investigation was as follows:

December 2003 – The initial sampling event included the following elements:

- ◆ collecting surface and subsurface sediment samples within the T-117 EAA
- ◆ collecting soil borings along the upland shoreline bank
- ◆ collecting soil samples from the southern drainage ditch and catch basins
- ◆ collecting water samples from intertidal seeps, and groundwater samples from shoreline monitoring wells
- ◆ a 24-hour tidal study to characterize the groundwater gradient beneath the nearshore T-117 upland area
- ◆ a groundwater non-aqueous phase liquid investigation, which was also re-conducted in August 2004

March 2004 – Large asphalt deposits and other major debris located in the shoreline bank and south ditch were identified, described, and mapped.

March 2004 – Following the initial sample collection effort, the areal extent of PCB contamination in the northern portion of T-117 was still unbounded. Additional surface and subsurface sediment and soil boring samples were collected from the bank in the northern portion of T-117.

March 2004 – Soil samples from the roadway along the entrance area of the T-117 property and additional catch basins were collected to evaluate whether these materials are the likely source of elevated PCBs in and around catch basin 5.

These results were summarized and interpreted in the T-117 preliminary boundary technical memorandum (Windward et al. 2004b) and used to delineate the preliminary removal boundary. Following the preliminary removal boundary delineation, there was still some uncertainty about the nature and extent of PCB contamination in the northern portion of the T-117 EAA and other chemicals outside of or below the extent of PCBs. To better define the removal boundary the following sampling events were conducted:

June 2004 – Surface sediment samples collected outside the offshore northern portion of the preliminary removal boundary were analyzed for

PCBs, and archived samples collected in December 2003 that were either outside of the removal boundary or below the vertical extent of PCB contamination were analyzed for additional chemicals.

September 2004 – Surface and subsurface samples were collected in the northern portion of the site that extends into the proposed South Park Marina dredge area. This sampling event was conducted to satisfy both the EPA T-117 EAA boundary definition and the Puget Sound Dredged Disposal Agency (PSDDA) sediment characterization requirements for the South Park Marina. The PSDDA results, which identify sediments that are suitable for open-water disposal, are presented in a separate data report (Windward et al. 2005b).

Based on the results of the iterative sampling and analysis program, a proposed removal boundary was delineated (see Appendix A, T-117 proposed removal boundary technical memorandum). The data to support the rationale for the boundary definition are summarized in Section 2.4 of this EE/CA. With the exception of the PSDDA results, all physical and analytical results from the sampling and analysis activities are discussed above and are presented in the T-117 data report (Windward et al. 2005a).

Additional fieldwork was conducted in June 2005 to further address the extent of soil PCB contamination in the vicinity of the upland (west) side of the preliminary removal action boundary and the south ditch area in accordance with an addendum to the QAPP (Windward et al. 2005c). Additional soil boring and push-probe samples were collected to further refine the distribution of PCBs in these areas. Two new shoreline monitoring wells were installed in the northern shoreline area, all wells on T-117 were checked for the occurrence of NAPL, and another round of groundwater sampling was conducted in the shoreline wells. The results of this investigation are pending and will be provided to EPA and shared with the public in a separate technical memorandum. This memorandum will also discuss any needed refinements to the proposed removal action boundary and design of the proposed alternative as may be warranted by the results. If required, refinements may include removal in paved areas inland of the proposed boundary.

Sediments located outside the proposed removal boundary will continue to be evaluated for potential ecological and human health risks through the LDW baseline risk assessment process. If these sediments are found to have unacceptable risks they will be evaluated for remediation in the LDW feasibility study.

The streamlined ecological risk assessment, presented in Section 2.5, supports the appropriateness of the removal action. This risk assessment focused on the benthic invertebrate community by comparing chemical concentrations in surface sediments to Washington State Sediment Management Standards (SMS).

PCB concentrations that exceed the SMS Cleanup Screening Level (CSL) are expected to increase the likelihood of adverse biological effects to benthic organisms. More mobile receptors (i.e., fish and wildlife) were assessed during the Phase 1 remedial investigation (RI). The Phase 2 RI will refine the risk estimates for the mobile receptors and for any chemicals in sediment outside of the T-117 removal boundary. The removal action is also supported by a summary of the LDW Phase 1 human health risk assessment that includes a list of potential risks to human health associated with PCBs in the LDW. The proposed removal action at T-117 will indirectly reduce human exposure to chemicals by removing sediment containing bioaccumulative chemicals (i.e., PCBs) that are found in seafood. The removal action is further supported by the potential contamination of sensitive ecosystems, as demonstrated by the presence of PCBs above the CSL in intertidal sediment. These intertidal sediments provide important habitat for benthic invertebrates and juvenile salmonids, as well as other fish and shorebirds.

SCOPE, GOAL, AND OBJECTIVE OF THE REMOVAL ACTION

The goal of the removal action is to reduce exposure of ecological receptors and humans to PCBs in LDW surface sediment. The objectives of the removal action are to:

- Reduce the concentrations of contaminants in surface sediments (biological active zone, 0-10 cm) within the removal area boundary to below the SQS for PCBs (12 mg/kg OC) as much as practicable.

- Ensure that any remaining bank contamination at T-117 will not be released into the waterway and result in potential exposure to human and ecological receptors and recontamination of sediment.

The T-117 removal boundary was developed using a weight-of-evidence approach, based on 167 new PCB analysis results from material collected along the T-117 shoreline bank and from offshore sediments and with consideration of available historical data.

As currently proposed, the area left outside of the in-water removal boundary (from the boundary out to the navigation channel line and up to 300 ft north and south of the boundary) has an average PCB concentration (8.4 mg/kg, organic-carbon-normalized [-OC]) below the SQS for PCBs (12 mg/kg-OC). Following the removal action, the average PCB surface sediment concentration within the removal area will also be well below the PCB SQS, because most of the new surface will consist of new material.

REMOVAL AREA PHYSICAL SETTING

The removal area includes the upland unpaved area adjacent the shoreline, the bank extending down to the waterway, and adjacent intertidal to shallow

subtidal sediment areas. The area within the boundary has been subdivided into four zones characterized by similar physical characteristics based on the removal action approach that emphasizes using land-based earthwork equipment whenever reasonably possible.

Upland—This is the portion of the site above elevation +14 ft MLLW (approximately 1 ft above the expected highest tide at the site) that is located between the existing paving and the toe of the slope that extends down to the waterway. Removal action in the upland zone would be completed by land-based equipment.

Bank—The bank is adjacent to the upland. It starts at elevation +14 ft MLLW near the top of the slope and extends down to the waterway to the start of the intertidal mudflat at about elevation +5 ft MLLW. The bank is mainly covered with blackberry vegetation, and is composed of a mixture of soil, debris, and creosote-treated timber bulkheads. Removal action in the bank zone would be completed by land-based equipment working when tidal waters are generally not present.

Mudflat—The mudflat zone is adjacent to and offshore of the bank. The mudflat zone starts at the toe of the bank slope and extends out to the existing 0 ft MLLW contour. Removal action in the mudflat zone would be completed by land-based equipment working when tidal waters are generally not present.

Submerged—The submerged zone is adjacent to and offshore of the mudflat zone and extends to the outboard removal boundary, typically near elevation -5 ft to -8 ft MLLW. Removal actions in the submerged zone would be completed with floating equipment working when the tides are high enough to provide the draft required for the barges.

IDENTIFICATION OF REMOVAL ACTION ALTERNATIVES

Two removal action alternatives have been developed for the T-117 removal area, based on options that were carried forward from the initial screening of technologies for the different site zones. The two technologies considered for the removal action are:

- 1) Removal of the impacted material from the site
- 2) Capping of the impacted material so that it is isolated from exposure to the public and the environment

Removal and capping actions are considered within two distinct sets of areas according to whether they will be applied from the upland side of the site (land-based removal action) or as in-water (waterway-based removal action).

Excavation of the upland, bank, and mudflat sediments is planned to be completed with upland-based earthmoving equipment (excavators, front-end

loaders, and dump trucks). Waterway-based work would be completed with a barge-mounted mechanical dredge and sediment haul barges.

Alternative 1 –Combines the options that focus on the removal of PCBs from the site, with capping along the upland/bank, and incorporates backfilling of the mudflat and subtidal zones after dredging to re-establish the original grades.

Alternative 2 –Combines the options that focus on removal of the higher concentration PCBs from the upland/bank and near-bank intertidal sediment, with capping of the lower concentration PCBs in the intertidal and subtidal sediment.

Treatment and disposal technologies were considered for the T-117 removal area and screened based on site-specific conditions. The technology selected for both alternatives is land disposal (landfilling) of PCB-contaminated soil and sediment according to the requirements mandated under the Toxic Substances Control Act (TSCA) and set forth in 40CFR761. All soil and sediment containing less than 50 mg/kg dry weight (dw) PCB would be transferred to a site licensed under the Resource Conservation and Recovery Act (RCRA) as a Subtitle D commercial landfill. Soil from the upland, bank, or mudflat areas determined to contain 50 mg/kg dw or greater PCBs would be loaded and delivered to a TSCA landfill. Two regional landfills have established services to receive dredged sediments and low-concentration (PCB<50 mg/kg dw) contaminated soil: Roosevelt Regional Landfill near Goldendale, Washington, and Columbia Ridge Landfill near Arlington, Oregon.

In the case of the upland excavation, PCB concentrations in some upland soils are equal to or exceed 50 mg/kg dw and, if landfilled, must be placed in a hazardous waste landfill permitted by EPA under section 3004 of RCRA, or authorized by a State under section 3006 of RCRA, or in a PCB disposal facility approved under the TSCA rule. Landfills meeting these requirements and servicing the northwest include the Chemical Waste Management facility located at Arlington, Oregon, accessible from Seattle by rail, and the US Ecology chemical waste landfills at Grand View, Idaho, and Beatty, Nevada. The selection of specific landfill services will be made as part of the final design and removal action contractor selection process.

A no-action alternative was not considered for the T-117 removal area. Such an alternative would not satisfy the removal action objective of removing or controlling PCB-containing sediment at the T-117 EAA that has the potential to be released to the waterway and result in adverse PCB sediment concentrations in the LDW.

RECOMMENDATIONS

Alternatives 1 and 2 are similar in regard to effectiveness, implementability, and cost. Alternative 1 offers the advantage of increased removal of PCBs and lesser extent of capping, but also has a higher risk for short-term release during excavation and dredging and at a higher initial cost than Alternative 2.

Alternative 2 offers the advantage of a lower potential for short-term releases due to a lower volume of in-water removal as well as a lower initial cost, but comes with a higher risk for long-term release from the larger capped area. Both alternatives are considered valid and viable for the T-117 removal action. The Port and City are recommending Alternative 1 because it removes a greater volume of PCBs from the environment with a lesser risk of potential future release of PCBs to the LDW.